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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

LANDAU, MATTHEW C

ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 03/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/727,222	Applicant(s) KOO ET AL.	
	Examiner Matthew Landau	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-7,9,10,12,16-19,21,22,24 and 27 is/are rejected.
- 7) ☒ Claim(s) 3,8,11,13-15,20,23,25 and 26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>8/30/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the first angle larger than the second angle (claim 17), as well as the second angle is about zero degrees (claim 27) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claim 1 is objected to because of the following informalities:

Regarding claim 1, the limitation “wherein a direction of current flow in the channel area of the switching thin film transistor is different from” is objected to. This limitation is essentially repeated further down in the same paragraph. Also, the paragraph beginning “wherein the direction of current flow with respect to...” (the last paragraph of the claim) is redundant and should be deleted.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4-7, 9, 10, 12, 16-19, 21, 22, 24, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komiya et al. (US Pat. 6,456,013, hereinafter Komiya) in view Jung (US Pat. 6,177,301).

Regarding claims 1 and 2, Figure 3 of Komiya discloses a flat panel display having a plurality of sub-pixels, each sub-pixel comprising: a light emitting device; a switching thin film transistor 30 including a semiconductor active layer 13 having at least a channel area 13c for transferring a data signal to the light emitting device; and only one driving thin film transistor 40

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including a semiconductor active layer having at least a channel area for driving the light emitting device so that a predetermined current flows through the light emitting device according to the data signal. Figure 5A of Komiya discloses the amorphous silicon film is crystallized by scanning a laser beam on the film in the horizon direction (col. 9, lines 28-40). Komiya does not specifically disclose the channel area of the switching transistor is situated along a first direction (current flow direction in the channel) with respect to a grain boundary and the channel area of the driving transistor is situated along a second direction (current flow direction in the channel) with respect to a grain boundary, and that the first direction is different from the second direction. Figures 4A-4C and 6 of Jung disclose crystallizing an amorphous silicon layer using a sequential lateral solidification (SLS) technique, which involves scanning a laser beam across a substrate (col. 4, line 39 – col. 5, line 11). Using the SLS method results in grains growing parallel (on the average) to the scanning direction (as shown in Figure 6). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Komiya by using SLS to form the polycrystalline silicon layer used in the active regions for the purpose of enhancing the uniformity of the physical characteristics of the TFTs formed on the substrate (see abstract of Jung) and increasing grain size. When an SLS method is used to form the device of Komiya, the grain boundaries will extend in a direction parallel to the laser scan direction (shown in Figure 5A). Therefore, after the above modification, a direction of current flow in the channel area of the driving TFT 40 with respect to a grain boundary at the channel area of the driving TFT is different from the direction of current flow with respect to a grain boundary at the channel area of the switching TFT. Regarding claim 2, it follows that the current mobilities in each transistor are different.

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Regarding claim 4, Komiya discloses the active layer is formed using poly-Si (col. 7, line 26).

Regarding claims 5 and 18, it is inherent when using the SLS method that the grains will be anisotropic.

Regarding claims 6 and 19, a further difference between Komiya and the claimed invention is a crystal grain has a first length which is at least 1.5 times longer than a second length in direction which is substantially perpendicular to a direction of the first length. When using the SLS method, it is inherent that crystal grains in the active layers have first and second lengths, and that the first length (in a direction parallel with crystal growth direction shown in Figure 5A) is longer than the second length (in a direction perpendicular to the crystal growth direction). It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the invention of Komiya by having the first length be at least 1.5 times longer than the second length, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 7 and 16, after the above modification, it is inherent that the channel area of the switching TFT and the channel of the driving TFT have polycrystalline Si crystal grains, the silicon grains include longer grain boundaries situated along a direction which makes a first angle with a direction of current flow in the channel of the switching TFT and a second angle with a direction of current flow in the channel area of the driving transistor, wherein the first angle is not the same as the second angle.

Regarding claims 9 and 21, when using the SLS method, it is inherent that the polycrystalline semiconductor will have “primary” grain boundaries that are perpendicular to the direction of the “side” grain boundaries of the anisotropic grains, and that the average interval between the side grain boundaries is shorter than the average interval between adjacent primary grain boundaries.

Regarding claims 10 and 22, it is inherent that the direction of current flow in the channel area of the switching TFT makes a first angle with a direction along which the primary grain boundaries are situated, and that the driving TFT makes a second angle.

Regarding claims 12 and 24, when the scan (crystal growth) direction is horizontal as shown in Figure 5A of Komiya, the side grain boundaries will extend in the horizontal direction. Komiya discloses the channel regions of the switching transistor 30 are at a 45 degree angle with the gate lines 51 (col. 7, lines 50-52). Therefore, the channel regions are also at a 45 degree angle (approximately) with respect to the side grain boundaries.

Regarding claims 17 and 27, Figure 3 of Komiya discloses the second angle is approximately zero. Therefore, the first angle is larger than the second angle.

Allowable Subject Matter

Claims 3, 8, 11, 13-15, 20, 23, 25, and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments


Applicant's arguments with respect to claims 1-27 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and (571) 273-8300 for After Final communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should any questions arise regarding access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Matthew C. Landau

March 5, 2006